GASTROPOD COMMUNITIES IN SEAGRASS BEDS AT BARRANG LOMPO ISLAND, SOUTH SULAWESI

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ABSTRACT

A study of gastropod communities was done on seagrass beds around Barrang Lompo Island, South Sulawesi. Nine species of seagrasses and 81 species of gastropod were found. Diversity index ranged from 0.9575 to 1.3254 while evennes index ranged from 0.7162 to 0.9573. The value of community similarity based on the Canberra metric ranged between 0.2277 and 0.4949.

INTRODUCTION

Seagrass ecosystem is one of the marine ecosystems which has high productivity (Odum 1957, den Hartog 1970). In the estuarine and shallow water environment, seagrass beds have many functions, such as a primary producer/food source (Thayer *et al*. 1975), as raw materials for fertilizer (McRoy and Helffreich 1980), as a sediment stabilizer (Thorhaug 1986), and as the suitable habitat of various organisms (Kikuchi and Peres 1977). In Indonesia, 12 species of seagrasses were recorded. Most of them live in the intertidal and upper subtidal fringe around the mainland and the coral islands (Hutomo *et al*. 1989).

Barrang Lompo Island is one of the inhabited islands at Spermonde Archipelago, and is seven miles west of Makassar, Indonesia. Several studies have been carried out on this area and mostly concentrated on coral reefs and fishes. However, no research has been recorded about seagrass – molluscan communities in Barrang Lompo Island. Thus, the objective of the present paper was to determine the species composition and to investigate the abundance of gastropods living in seagrass beds at Barrang Lompo Island.

MATERIALS AND METHODS

Barrang Lompo Island is located between 05º02'42" and 05º03'06" South and 119º19'37" and 119º19'49" East. The sampling sites are in the western part of the island. The study area is divided into five stations based on the composition of seagrass communities, in order to get a picture of the densities of gastropods (Figure 1).

In this study, only gastropods found in seagrass beds were investigated. Sampling was done in August and September 1998 using the method recommended in Dartnall and Jones (1986) with modifications based on conditions at the study area. Transects were laid perpendicular to the coastline with 20 m intervals between each station. The transects were set at 50 m apart and parallel to each other.

A quadrat (1.0 x 1.0 m) fibreglass frame was used to estimate the percent coverage of seagrasses and to determine the snail densities. To facilitate counting, this frame was divided into 25 small areas (0.2 x 0.2 m). Three replicate counts were sampled in each station.

Complete samples of vegetation and associated gastropods were hand-picked from within the frame for laboratory analysis. Each quadrat samples were fixed with 5% seawater formalin solution. All collections were made during the day.

In the laboratory, specimens were rinsed, cleansed of adhering debris, and sorted out to species and then transferred to 70% alcohol. References for identification of seagrasses used were those of den Hartog (1970), Meñez *et al*. (1983), Hutomo (1985), Phillips and Meñez (1988), and Fortes (1989). Identification of gastropods was done according to descriptions in Dharma (1988, 1992), Abbott (1991), and Roberts *et al*. (1992).

Diversity (H') and evennes (J') were calculated using the Shannon index (Brower *et al*. 1989):

$$H' = -\sum p_i \log p_i$$

$$p_i = \frac{n_i}{N}$$

$$J' = \frac{H'}{H\max'}$$

$$H\max' = \log S$$

where p_i is the proportion of the total number of individuals occuring in species *i*, n_i is individuals in the i^{th} species, N is the total number of individual in all the species, and S is number of species.

Similarities between stations were expressed using abundance data (number of individuals per species). These similarities were calculated based on the Canberra metric (ICM) (Brower *et al*. 1989):

$$I_{CM} = 1 - \frac{1}{S}\sum \frac{|x_i - y_i|}{(x_i + y_i)}$$

where x_i is abundance of species *i* in station 1, y_i is abundance of species *i* in station 2, and S is total number of species found in station 1 and 2. Zero counts were set at 0.2

(Clifford and Stephenson 1975). A value of 0 shows that communities at station 1 and 2 are vastly different, whereas a value of 1 shows that species composition and abundance of both stations are identical.

RESULTS AND DISCUSSION

Nine seagrass species from six genera were found at Barrang Lompo Island. These were *Cymodocea rotundata* Ehrenberg and Hemprich ex Ascherson, *Cymodocea serrulata* (R. Brown) Ascherson and Magnus, *Enhalus acoroides* (Linnaeus f.) Royle, *Halodule pinifolia* (Miki) den Hartog, *Halodule uninervis* (Forsskål) Ascherson, *Halophila ovalis* (R. Brown) Hooker f., *Halophila* sp., *Thalassia hemprichii* (Ehrenberg) Ascherson, and *Syringodium isoetifolium* (Ascherson) Dandy. In this study, *Halodule uninervis*, *Halophila ovalis* and *Thalassia hemprichii* were widely distributed while *Halophila* sp. and *Syringodium isoetifolium* were found only at Station C (Table 1).

Table 1. Species composition and percent coverage of seagrass in five stations at Barrang Lompo Island.

Species	Station				
	A	B	C	D	E
Cymodocea rotundata	52.39	52.40	53.61	30.55	-
Cymodocea serrulata	89.77	15.33	-	20.58	-
Enhalus acoroides	43.38	33.48	80.23	32.89	-
Halodule pinifolia	62.08	32.21	23.57	-	-
Halodule uninervis	58.51	18.92	75.72	23.33	78.85
Halophila ovalis	23.59	18.72	49.17	21.22	19.11
Halophila sp.	-	-	10.14	-	-
Thalassia hemprichii	90.97	99.74	96.22	99.72	3.50
Syringodium isoetifolium	-	-	65.33	-	-
Mean	46.74	30.09	50.44	50.44	11.27

Furthermore, Table 1 shows percentage of seagrass cover in each station. It can be seen that *Thalassia hemprichii* was dominant at station A, B, C, and D, while *Halodule uninervis* was dominant at station E. Effect of human activities such as fish landing sites is believed to be responsible for degradation of grass beds in station E.

A total of 1117 individuals comprising 81 species of gastropod from 28 families were collected during this study. The number of species varied between stations. Highest density was found at station C and the lowest at station E, while the greatest number of species was found at station B and only 10 species from 8 families were found at station E (Table 2). There were five species present throughout all stations, e.g. *Pisania* sp., *Rhinoclavis vertagus*, *Conus* sp., *Littorina undulata,* and *Clithon oualaniensis*. Among these, *Rhinoclavis vertagus* was found to be the most abundant species.

Table 3. Species composition and abundance of gastropods found in five stations at Barrang Lompo Island

Taxa	Station				
	A	B	C	D	E
01. Architectonicidae					
01. *Architectonica* sp.	-	-	1	-	-
02. Buccinidae					
02. *Engina zonalis*	4	3	8	-	-
03. *Engina* sp.	1	-	-	-	-
04. *Pisania* sp.	11	7	10	3	1
03. Bullidae					
05. *Atys cylindricus*	2	19	84	8	-
06. *Bulla ampulla*	-	1	-	-	-
07. *Bulla vernicosa*	-	1	-	-	-
04. Bursidae					
08. *Bursa* sp.	-	-	1	-	-
05. Cerithiidae					
09. *Cerithium columna*	10	10	-	-	-
10. *Cerithium kobelti*	-	-	1	-	-
11. *Cerithium nodulosum*	2	-	2	-	-
12. *Cerithium* sp.	1	-	-	-	-
13. *Clypeomorus batillariaeformis*	-	2	-	-	-
14. *Clypeomorus moniliferus*	-	1	-	-	-
15. *Clypeomorus tuberculatus*	-	7	2	-	-
16. *Rhinoclavis asper*	14	7	17	5	-

	17. *Rhinoclavis kochi*	1	8	3	-	-
	18. *Rhinoclavis vertagus*	60	51	63	43	2
6. Columbellidae						
	19. *Columbella* sp.	3	-	-	-	-
	20. *Pyrene flava*	-	-	1	-	-
	21. *Pyrene punctata*	1	-	-	-	-
	22. *Pyrene scripta*	14	21	6	11	-
	23. *Pyrene testudinaria*	-	10	-	-	-
7. Conidae						
	24. *Conus miliaris*	-	-	4	-	-
	25. *Conus musicus*	-	-	-	1	-
	26. *Conus* sp.	1	2	9	5	1
8. Cyclostrematidae						
	27. *Arene sarcina*	-	-	3	2	-
	28. *Liotina peronii*	2	2	1	-	-
9. Cypraeidae						
	29. *Cypraea annulus*	5	4	3	-	1
	30. *Cypraea clandestina*	-	2	1	1	-
	31. *Cypraea moneta*	-	-	-	1	1
	32. *Cypraea pallidula*	-	1	-	-	-
	33. *Cypraea quadrimaculata*	-	-	1	-	-
	34. *Cypraea* sp.	-	1	-	2	-
10. Epitoniidae						
	35. *Epitonium lamellosa*	-	-	2	-	-
	36. *Epitonium scalare*	-	1	1	-	-
	37. *Epitonium* sp.	1	-	-	-	-
11. Fasciolariidae						
	38. *Pleuroploca* sp.	-	1	-	-	-
12. Littorinidae						
	39. *Littorina undulata*	6	10	11	40	1
	40. *Tectarius tumpersicum*	-	-	-	2	-
13. Mitridae						
	41. *Cancilla praestantissima*	1	-	-	-	-
	42. *Mitra tabanula*	-	-	1	1	-
	43. *Mitra turgida*	1	-	-	-	-
	44. *Mitra* sp.	10	12	17	1	-
14. Muricidae						
	45. *Morula margariticola*	2	-	-	1	-
15. Nassariidae						
	46. *Nassarius albescens*	3	1	-	2	1
	47. *Nassarius venustus*	-	1	1	-	-
	48. *Nassarius* sp.	2	-	-	1	-
16. Naticidae						
	49. *Natica sertata*	-	1	1	-	-
	50. *Polinices aurantius*	-	-	-	-	1
	51. *Polinices mammatus*	-	-	1	-	-
	52. *Polinices melanostomus*	7	5	1	1	-
	53. *Polinices sebae*	1	1	8	2	-
	54. *Polinices tumidus*	1	3	1	1	-
	55. *Polinices* sp.	1	1	2	7	-
17. Neritidae						
	56. *Clithon oualaniensis*	25	59	54	28	3
	57. *Nerita* sp.	-	-	3	-	-
	58. *Neritina turrita*	1	1	-	-	-
18. Olividae						

	59. *Oliva tesselata*	-	-	-	1	-
	60. *Oliva* sp.	4	8	13	3	-
19. Ovulidae						
	61. *Prionovula* sp.	-	6	-	-	-
20. Potamididae						
	62. *Cerithidea cingulata*	-	3	-	-	-
	63. *Cerithidea* sp.	4	-	-	-	-
21. Pyramidellidae						
	64. *Milda ventricosa*	4	2	2	-	-
	65. *Otopleura auriscati*	2	1	2	3	-
	66. *Pyramidella acus*	10	8	4	4	-
	67. *Pyramidella dolabrata*	2	-	-	-	-
22. Strombidae						
	68. *Strombus gibberulus*	-	-	-	3	-
	69. *Strombus lobiatus*	3	1	-	-	-
	70. *Strombus mutabilis*	-	-	1	-	-
	71. *Strombus urceus*	4	2	-	1	-
	72. *Strombus* sp.	7	2	2	-	-
23. Terebridae						
	73. *Terebra babylonia*	1	-	1	-	-
	74. *Terebra subulata*	-	-	-	-	1
24. Turbinidae						
	75. *Turbo* sp.	-	1	-	-	-
25. Turridae						
	76. *Turricula* sp.	1	1	-	-	-
26. Trochidae						
	77. *Chrysostoma paradoxum*	3	7	-	-	-
	78. *Trochus* sp.	-	-	1	2	-
	79. *Umbonium vestiarium*	3	11	3	7	-
27. Turritellidae						
	80. *Turritella* sp.	1	2	-	1	-
28. Volutidae						
	81. *Cymbiola chrysostoma*	-	1	-	-	-
TOTAL		243	313	354	194	13

The differences of seagrass species and percent cover of seagrass could contribute to the difference in species composition and also influenced the abundance of gastropods. According to Heck and Orth (1980), diversity and abundance of fishes and invertebrates will be related to seagrass morphology or seagrass surface area and species richness and abundance of animals should increase with increasing of seagrass density. In this study, the number of species and the the total abundance of species of stations which have higher seagrass density (stations A, B, C and D) were significantlyt higher than station E which has lower density.

The most abundant family in the present study was Cerithidae, 12.35% of total species number and 27.93% of total abundance. Cerithidae live gregariously on sand, weed or among coral rubble in shallow water. Generally, they are herbivorous or detrital feeders (Wilson and Gillett 1971). Fenchel (1970) found that organic detritus, either suspended or on the bottom, is abundant in *Thalassia* environments. Most of study sites at Barrang Lompo Island consisted of many species of seagrass, especially at station A, B, C, and D. It is assumed that the organic detritus derived from the leaching and partial breakdown of seagrass was abundant. The organic detritus were used as food by many deposit and suspension feeding animals (Fenchel 1970), including Cerithidae.

In general, diversity indices (H') were low, ranging between 0.9575 and 1.3254. The evennes idices (J') were moderate, ranged from 0.7162 to 0.8041, except at station E (Table 3). In this case, the low species diversity did not mean that gastropod populations of Barrang Lompo Island was low.

Table 3. Gastropods ecological indices. N = total number of individuals in all species, S = number of species, H' = Shannon diversity index, and J' = evennes index

Station	N	S	H'	J'
A	243	44	1.3214	0.8041
B	313	48	1.3356	0.7944
C	354	43	1.1642	0.7127
D	194	32	1.1327	0.7526
E	13	10	0.9575	0.9575

Community similarity index based on the Canberra metric were used to analyse the difference or similarity in terms of species composition and abundance of gastropods among stations (Table 4). In all cases, the community similarity index had the lower value (< 0.5). Stations A and B had the highest similarity index and the lowest was stations A and E.

Table 4. Community similarity based on the Canberra metric

Station	Station				
	A	B	C	D	E
A	1.0000	0.4896	0.4214	0.4425	0.2290
B		1.0000	0.4696	0.3853	0.2571
C			1.0000	0.4448	0.2545
D				1.0000	0.3494
E					1.0000

ACKNOWLEDGEMENTS

We wish to express our grateful to Harliah Harun for the field work collection. Special thanks to Noer Alam Patiwi for preparing the manuscript and Fitri Anggraini Suhilman for her invaluable comments and suggestion in improving this paper.

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